good close to the transmit focus and poor everywhere else, unless a large transmit F number is used, in which case spatial resolution is poor everywhere. For this reason, radiology systems commonly employ multiple firings (zones) for each acoustic line, with the transmit focus being different for each firing, and use a small transmit F number to produce good spatial resolution for a small range close to the focus depth. The final receive data for each acoustic line is spliced together from the pieces of each receive vector which are close to the corresponding transmit focus depth for that firing. Some tapering is usually applied to avoid noticeable discontinuities in average scene brightness from zone to zone. The NumZones window 66 and several of the windows to follow ask the user to specify the number of active zones and the range of zone indices to use, and then ask the user to specify various properties on a per-zone basis.

[0084] After the user has specified the physical parameters for the transducer, and the way the user wants to set up the ultrasound beam simulator, the user is nearly finished. The next two windows (68 and 70 in FIG. 7) of the Transducer Design Advisor deal with the input and output variables that are candidates for participating in a set of simulations governed by a DOE matrix. The DOEReview window 68 allows the user to view the available DOE input variables (x's) and read descriptions of what they mean. The set of DOE variables varies somewhat depending on what kind of probe is being simulated. The subset of these variables which is applicable to the user's probe parameters will be automatically selected by the Transducer Design Advisor and displayed to the user in window 68. There are no user inputs in this window, so the user must click the Next button when the user has reviewed the input variables.

[0085] Similarly, the CTQReview window 70 (see FIG. 7) displays a list of the CTQ output variables (Y's). The list comprises a column of CTQ variable names, a column of brief descriptions of those variables, and a column indicating the units (e.g., "% change"). The units are constructed so

that a positive number means a change to lower quality for that CTQ, a negative number means a change to higher quality for that CTQ, and a zero number means no change in quality for that CTQ. This is to allow an overall "Badness", or "Cost" function, to be minimized by the DOE toolset. At the beginning of a DOE simulation run, a separate simulation run (invisible to the user except for the extra time it takes) is performed to generate normalization data for computing the percentage changes. This normalization run is the same as having a row of the DOE matrix with all zeros for the encoded values. The list of CTQ output variables includes the following: ElevSLE, sidelobe energy measured in elevation; AzSLE, sidelobe energy measured in azimuth; AzMainWidth, 3 dB width of the main beam lobe measured in azimuth; ElMainWidth, 3 dB width of the main beam lobe measured in elevation; MainAx, 6 dB width of pulse measured axially; MaxInvArea, inverse of minimum azimuthal width of main lobe; MaxDiscontinuity; maximum gradient of system amplitude response over range. There are no user inputs in window 70, so the user must click the Next button to proceed.

[0086] The CTQWeights window 72 (shown in FIG. 11) allows the user to set the relative importance of each CTQ as a function of range. The value of each CTQ is an integral part of a Marketing Requirement Specification, and represents a team's collective knowledge of the clinical needs for the application(s) for a particular probe being simulated. In the computation of the overall "Badness", the CTQ values are multiplied by these weights prior to summation. This method allows for the common situation where a particular Y is crucial in a certain part of the image and less critical elsewhere. To enter a set of weights for a CTQ, where the weights vary according to range, the user simply drags a line segment up or down with the mouse pointer, with the vertical position of the line specifying the weight at each range. Each line can be broken into any number of segments with each segment specifying a different weight. A new segment boundary can be created by clicking the mouse button at the desired position with the keyboard Control key held down.

[0087] The SaveFiles window 74 (see FIG. 7) is merely a final confirmation window before the Transducer Design Advisor writes all of its output files to the folder and root name that the user originally specified. The user must click on the Next button to save the files and finish. If the user wants to first review the user's inputs for correctness, the user can use the Back button to move backwards through the windows the user has previously visited. There are two text fields in window 74: the top field shows the directory where the user's work will be saved, and the bottom field shows the root filename for all the files that will be saved.

[0088] The InstallRemote window 76 allows the user to upload the user's completed file set to the remote server 82 (see FIG. 4) which will be hosting the simulation. The "Remote Host" text field will already be filled in with the name of the preferred server for the user's installation. In order for the user to be able to upload files, the user must have already been given a username and password for the remote system. The user enters that username and password into the text fields provided. The root name for the file set the user is working on is already entered into a corresponding text field in the window. The complete file set consists of the five previously identified files. After the user has entered his/her username and password, the user clicks on an "Install" button to upload the files from the user's PC 80 to the remote server 82 via the network 84. After the installation has successfully completed, the user can proceed to the final window by clicking the Next button.

[0089] If the user has made it to the final window, the user's work has been saved and the user is now ready to create a DOE matrix and start simulating. The user exits the Transducer Design Advisor. To perform a DOE run, the user starts up Excel (with DOE extensions). The user requests that a new simulation be run. The user must specify the remote host where the simulation files have been uploaded. This host is running a copy of the analysis server 100. The analysis server detects the incoming request and